Clayton GROUP SERVICES

Health and Safety Plan

Lockformer
711 W. Ogden Avenue
Lisle, Illinois

William S. Elwell
Site Health and Safety Officer — 2/20/03 Date

Russell J. Chadwick
Office Health and Safety Officer — 2/20/03 Date

Darren W. Lamsma
Alternate Site Health and Safety Officer — 2/20/03 Date

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ATTACHMENTS

ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
CHRIS	Chemical Hazards Response Information System
Clayton	Clayton Group Services, Inc.
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
eV	Electron-volt
HASP	Health and Safety Plan
MSDS	Material Safety Data Sheets
NIOSH	National Institute for Occupational Safety and Health
OHSO	Office Health and Safety Officer
OSHA	Occupational Safety and Health Administration
PHSO	Project Health and Safety Officer
PID	Photoionization detector
PM	Project Manager
PPE	Personal protection equipment
PPM	Parts per million
SHSO	Site Health and Safety Officer
SRH	Soil Resistive Heating
SVE	Soil Vapor Extraction
TCE	Trichloroethene
PCE	Tetrachloroethene
DCE	1,2-Dichloroethene
USCG	United States Coast Guard

1.0 GENERAL INFORMATION AND SCOPE OF WORK

The Lockformer Company (Lockformer) has retained Clayton Group Services, Inc. (Clayton) to conduct further site investigation and remediation activities at the Lockformer facility located at 711 W. Ogden Avenue in Lisle, Illinois (site). Figure 1 shows the location of the site.

This Health and Safety Plan (HASP) describes the general procedures that are to be implemented to protect Clayton and its subcontractors involved with field investigation activities (as described in the Lockformer Work Plan) and remediation system installation activities (as described in the Technical Memorandum – Soil Remediation Design) to be conducted at the site. Additional health and safety procedures related to the operation of the remediation systems will be attached to this HASP as technical memoranda prior to remediation startup.

Several chemical, physical, and biological hazards will be present during site activities. The primary chemical hazards may result from exposure to trichloroethene (TCE), tetrachloroethene (PCE), and 1,2-dichloroethane (DCE) soil or groundwater at the site. Physical hazards include, but are not limited to, heavy equipment noise, slips, trips, falls, utilities, and heat and cold stress. Routine field activities should not involve exposure to biological hazards, such as body fluids. However, exposure to biohazards such as spiders, bees, snakes, etc. is possible during some field activities. An evaluation of the hazards that will be present during field activities is presented in Sections 2.0 through 2.7.

1.1 PROJECT DESCRIPTION

The objective of the investigation phase of this project is to obtain additional information regarding the presence of volatile organic compounds (VOCs) in the soil and groundwater at the site. The principal field activities to be conducted include:

- Drilling soil borings – Soil borings will be completed by direct-push, rotary hollow stem auger, and/or Rotasonic drilling techniques.
- Collecting soil samples from borings – Soil samples will be collected by placing an appropriate amount of soil into laboratory-supplied jars.
- Installing groundwater monitoring wells – Groundwater monitoring wells will be installed at the southern portion of the site to facilitate the collection of groundwater samples.
- Installing electrodes for the electrical resistive heating system – Electrodes will be installed in designated portions of the site in a manner similar to the installation of monitoring wells.
- Installing vapor extraction wells – Vapor extraction wells will be installed in select area of the site and incorporated into the soil vapor extraction remediation system.
- Installing vapor extraction piping.
- Developing monitoring wells – Monitoring wells will be developed by using a submersible pump or disposable bailers.
- Collecting groundwater samples – Groundwater samples will be collected via low flow techniques.
- Surveying – A professional licensed surveyor will survey all soil boring and well locations.
- Earthmoving – Grading of soil in the remediation area prior to and during construction of the plenum; trenching for subsurface piping installation.
- Off loading equipment – Remediation equipment will require off loading using heavy equipment.

Additional activities will include measuring water levels, decontaminating equipment, and handling investigation-derived and system installation-derived materials.

1.2 SITE LOCATION, HISTORY, AND CURRENT CONDITIONS

The site is located in south-central DuPage County, Illinois (Figure 1). The site comprises an east and west parcel that encompass a total of 18.5 acres (Figure 2). The east parcel, commonly referred to as the Lockformer parcel, is identified as Area 1. Area 1 comprises approximately 6.54 acres and is occupied by a single structure with associated landscaped and drive/parking areas. The structure is utilized by Lockformer as a manufacturing facility for production of sheet metal processing equipment and roll-forming machines. The west parcel, commonly referred to as the MetCoil parcel, has been divided into two separate areas. The northern portion of the MetCoil property will be referred to as Area 2, and the southern portion will be referred to as Area 3. The west parcel comprises approximately 11.96 acres of undeveloped land. The site is located in a mixed area of industrial, commercial, and residential use, approximately 1,300 to 1,800 feet west of Interstate 355.

The site is bounded to the north by Ogden Avenue, beyond which exists a residential subdivision; to the east by the Bill Kay car dealership; to the south by a surface water retention basin servicing the Bill Kay property (beyond which exists single-family homes) and the Burlington Northern railroad (beyond which exists St. Joseph's Creek and residential homes); and to the west by a multi-unit commercial building.

Soil impacted by TCE was first discovered in the fall of 1991 during underground utility (water line) repair work conducted along the west side of the Lockformer manufacturing building. The TCE impacts to soil and groundwater in Areas 1 and 2 are believed to be the result of filling operations of the roof-mounted TCE tank formerly located along the west side of the manufacturing building. The location of this tank can be reviewed in Figure 2.

A great deal of data has been collected at the site to date. Recent investigations in Areas 1 and 2 have primarily focused on the releases that resulted from the manufacturing processes associated with (and potentially impacting the area under and around) the facility building and releases associated with the TCE fill pipe. The Area 3 investigations have been primarily focused along the drainage ways and the sanitary sewer system.

An evaluation of the investigation results for the site has led to the selection of two remedial methods for the impacted soils in Areas 1 and 2: electrical resistive heating and soil vapor extraction.

1.3 PROJECT SAFETY REQUIREMENTS

1.3.1 Personnel

All Clayton personnel and subcontractors involved in field activities (see Section 1.1) must abide by the provisions of this Plan. All onsite operations must comply with federal, state, and local regulations and, as a minimum, must meet requirements of 29 CFR Part 1910.120.

Clayton personnel responsible for the health and safety of Clayton employees on this project include:

- Office Health and Safety Officer (OHSO): Russell J. Chadwick
- Site Health and Safety Officer (SHSO): William S. Elwell
- Alternate SHSO: Darren W. Lamsma
- Project Manager: Ron St. John

The following individuals located onsite will have the authority and responsibility to change levels of protection and, when necessary, shut down the operation:

- Site Health and Safety Officer
- Alternate Site Health and Safety Officer

Office Health and Safety Officer:

The Office Health and Safety Officer (OHSO) has overall responsibility for establishing appropriate health and safety procedures. The OHSO is responsible for documenting that employees have received proper health and safety training and have participated in a medical surveillance program. The OHSO will develop any new health and safety protocols and procedures necessary for new field operations or new situations.

Site Health and Safety Officer:

The Site Health and Safety Officer (SHSO) is responsible for documenting that the designated procedures and health and safety protocol are implemented in the field. The SHSO may be required to perform various types of area or personnel monitoring for purposes of verifying worker exposure and proper selection of personal protective equipment (PPE). The SHSO should be consulted before any changes in the recommended procedures or levels of protective clothing are made. The SHSO will conduct tailgate meetings to discuss and review site hazards and safety protocols at the beginning of each workweek, when a new field activity is initiated, or new personnel arrive onsite. The SHSO will be responsible for informing the OHSO of changes in field operations or conditions that might warrant new health and safety protocols or procedures. The SHSO will maintain a copy of all field operating procedures, standard operating procedures (SOPs), site health and safety plans, sign-in/sign-out logs, and exclusion zone entry/exit logs onsite during field activities.

Alternate Site Health and Safety Officer:

The Alternate Site Health and Safety Officer (ASHSO) is responsible for performing the duties of the SHSO in his/her absence. The ASHSO is responsible for any health and safety task delegated to him/her by the SHSO.

Project Manager:

The Project Manager (PM) has primary responsibility for fulfillment of the terms of the contract. He must oversee operations and ensure all legal and safety requirements are met. It is his duty to keep the project on schedule and within budget, and to communicate with the client regarding progress toward the specified project goals.

1.3.2 OSHA-Required Training and Medical Surveillance

Clayton employees and subcontractors on the site will have received a minimum of 40 hours of hazardous waste site investigation health and safety training, an annual 8-hour Refresher Course (as required in 29 CFR 1910.120), and be a participant in a medical surveillance program.

Under the OSHA Blood Borne Pathogen (BBP) standard, Clayton evaluated the working conditions for field activities and specific tasks where personnel may encounter human blood, body fluids, or tissues. Following categories outlined in OSHA's original proposal, the field activities associated with this project are classified as Category II. Category II includes tasks that routinely involve no exposure to human blood, body fluids, or tissues, but where, as part of their employment, personnel may encounter potential exposure to BBPs. Site-specific examples include, but are not limited to, sampling with the potential for exposure to body fluids (i.e., sampling along sanitary sewer lines) and situations where first-aid and CPR-trained employees would respond to an in-house emergency. Training for Category II personnel will include:

- Copies of the OSHA BBP standard (29 CFR 1910.1030).
- Explanations of
  - Epidemiology and symptoms of bloodborne diseases
  - Modes of transmissions
  - Different categories and tasks

  - Methods for recognizing potential exposures
  - Methods to prevent or minimize exposure
  - Labels required

- Information on the types, proper use, location, removal, handling, decontamination, and disposal of PPE.
- Information on the Hepatitis vaccine.
- Actions to take in an emergency.
- Procedures to follow in the event of an exposure incident, including spills.
- Information on post-exposure evaluation and follow-up after an exposure incident.
- Questions and answers.

Training will be conducted by a staff member knowledgeable in the subject. This individual will be appointed by the OHSO. Training records including dates of sessions, contents, name and qualifications of person(s) conducting training, and names and job titles of persons attending sessions will be maintained by the OHSO and provided as Attachment E.

1.3.3 First Aid

The Clayton SHSO will be immediately advised of any situation requiring more than minor first aid. A first aid kit that meets the requirements of 29 CFR 1926.50, as well as a biosafety kit, will be maintained in each Clayton vehicle onsite; supplies will be replenished by the SHSO as needed. Personnel aware of accidents or injuries will take immediate action to ensure that appropriate first aid is administered and will report the incident to the SHSO. The majority, if not all, of the Clayton personnel are certified and trained in first aid/CPR.

1.4 GENERAL GUIDELINES

The following personal hygiene and work conduct guidelines are intended to prevent injuries and adverse health effects. These practices establish general precautionary measures for reducing the risks associated with potentially hazardous work at site operations.

- All personnel are required to sign in upon arrival onsite and sign out at their time of departure in the daily sign-in log. The daily sign-in log (Attachment C) will be located at the primary meeting location.
- Eating, drinking, chewing gum or tobacco, taking medications, and smoking are prohibited onsite during field activities.
- Avoid direct contact with potentially contaminated substances; to the extent possible do not walk through puddles, pools, drill cuttings, or mud; avoid kneeling, leaning, or sitting on drums or working equipment. Do not place monitoring or sampling equipment on potentially contaminated surfaces.
- Be alert to potentially changing exposure conditions, including changes in wind direction, perceptible odors, unusual appearances of soil or groundwater, etc.
- Be alert to fatigue, heat or cold stress (Tables 1 and 2, respectively), and other environmental factors influencing the normal caution and efficiency of personnel.
- Onsite personnel will establish prearranged hand signals or other means of emergency communication when wearing respiratory equipment (equipment seriously impairs speech communications).
- Always use an appropriate level of personal protective gear. Lesser levels can result in unnecessary exposure; excessive levels of safety equipment can impair efficiency and increase the potential for accidents to occur. Alternative controls such as engineering controls and administrative controls will be considered prior to the use of PPE by the OHSO.
- The "buddy system" will be utilized for all work performed in exclusion zones. All personnel are required to sign in and out of exclusion zones using the exclusion zone entry/exit log (Attachment D). Prior to commencement of field activities, and

whenever the location changes, personnel will be notified of the location of the exclusion zone entry/exit log.

1.5 SITE SAFETY MEETING

Site safety orientation/training meetings (briefings) will be convened (1) before the field team begins work at the site; (2) when there are modifications to the HASP that are applicable to the field personnel; and (3) when additional personnel or subcontractors begin work. Meetings will be attended by personnel involved in carrying out the project and will be presided over by the SHSO or his/her designee.

The meeting agenda will include the following minimum activities:

- Review HASP with attendees.
- Distribute any HASP modifications.
- Collect attendees' signatures acknowledging receipt and understanding of the site and HASP and their agreement to comply with the plan (Tailgate Meeting Minutes Form, Attachment A).

2.0 HAZARD EVALUATION

Available data for the site indicate that potential chemical hazards may be present in various environmental media onsite. The following summarizes the potential chemical and physical hazards associated with each of the planned field activities:

Field Activity/*Risk Level*	**Potential Hazard**
Soil Boring and Soil Sampling *Moderate*	CHEMICAL: Direct contact with contaminants in soil; inhalation or ignition of escaping vapors or gases; inhalation of windblown dust. PHYSICAL: Heat/cold stress; heavy machinery noise; trips, slips, and falls; contact of drill rig with underground lines and of drill rig mast with overhead electrical lines.
Installing and developing monitoring wells; electrode installation; vapor extraction well Installation *Moderate*	CHEMICAL: Direct contact with contaminants in soil, groundwater; inhalation or ignition of escaping vapors or gases; inhalation of windblown dust; PHYSICAL: Heat/cold stress; heavy machinery noise; trips, slips, and falls; contact of drill rig with underground lines and of drill rig mast with overhead electrical lines.
Groundwater sampling *Moderate – Low*	CHEMICAL: Direct contact with contaminants in groundwater; inhalation or ignition of escaping vapors or gases in wells. PHYSICAL: Heat/cold stress; trips, slips, and falls.
Surveying *Low*	CHEMICAL: Inhalation of windblown dust PHYSICAL: Trips, slips, and falls.
Piping installation *Low*	CHEMICAL: Direct contact with contaminants in bonding materials; inhalation or ignition of escaping vapors or gases in bonding materials PHYSICAL: Heat/cold stress; trips, slips, and falls.
Earthmoving *Moderate*	CHEMICAL: Direct contact with contaminants in soil; inhalation or ignition of escaping vapors or gases; inhalation of windblown dust. PHYSICAL: Heat/cold stress; heavy machinery noise; trips, slips, and falls; contact of drill rig with underground lines and of drill rig mast with overhead electrical lines; excavation collapse.

NOTES:

For additional information regarding the chemicals of concern, refer to the MSDS sheets included as Attachment B.

2.1 SIGNS AND SYMPTOMS OF ACUTE EXPOSURE

The majority of current tasks slated for this project involve collection of soil and groundwater, and installation of the remediation wells, electrodes, and piping. These tasks could involve possible exposure to substances that may be hazardous to the health of site personnel. The risk of exposure via inhalation and skin contact is likely greater than ingestion. None of the suspected contaminants onsite are expected to volatilize in quantities great enough to permit dermal absorption of the gas.

The following chemicals of concern have been identified from previous subsurface investigations at the site. The signs and symptoms that may occur (function of concentration) as a result of exposure to these potentially hazardous constituents at the site are listed below:

- *Trichloroethene (TCE):* Symptoms of exposure include irritation of eyes and skin, headache, vertigo, visual disturbance, fatigue, giddiness, tremors, somnolence, nausea, vomiting, dermatitis, cardiac arrhythmias, paresthesia, and liver injury. The target organs include the eyes, skin, respiratory system, heart, liver, and central nervous system.

- *Tetrachloroethene (PCE):* Symptoms of exposure include irritation of eyes, nose, and throat, nausea, flushed face and neck, vertigo, dizziness, uncoordination, headaches, somnolence, skin erythema, and liver damage. The target organs include the eyes, skin, respiratory system, liver, kidneys, and central nervous system.

- *1,2-Dichloroethene (DCE):* Symptoms of exposure include irritation of eyes and respiratory system, and central nervous system depression. The target organs include eyes, respiratory system, and central nervous system.

The above information is from the *NIOSH Pocket Guide to Chemical Hazards*, U.S. Department of Health and Human Services, June 1997.

2.2 COLD STRESS

When temperatures are expected in the 40s or lower, especially during high winds, cold stress will be considered. Cold stress presents several different syndromes: mild hypothermia and profound hypothermia, frostbite, and chilblains.

The signs and symptoms of hypothermia include shivering, poor coordination, slowed pace, irritability, slurred speech, fatigue, and poor judgement. More severe hypothermia can result in stupor, collapse, and eventually death.

The signs and symptoms of frostbite include stiffness and numbness in body parts (i.e., nose, ears, toes, fingers, etc.), and a noticeable grayish or whitish skin color.

Workers are encouraged to wear layers of protective, insulated clothing; keep hands, head, and feet covered and warm; keep clothes dry; eat high-energy foods; and drink plenty of water.

Warm shelter will be provided out of the wind for rest periods. Crews are encouraged to get warm and dry during lunch periods. Warm liquids with caloric value will be provided, and ample water is essential. Dehydration is a factor in hypothermia and frostbite, and will be avoided.

Table 1 describes the recommended breaks for a 4-hour work period during periods of cold weather.

The medical emergency response procedures for victims who may have developed cold stress are outlined in Section 5.0.

2.3 HEAT STRESS

When activities require the use of coveralls and/or respirators, certain precautions will be taken to reduce the likelihood of heat fatigue, heat exhaustion, and heat stroke. Heat stroke, in particular, is a life-threatening condition. All employees will be alert to the symptoms of heat exhaustion, which include extreme fatigue, cramps, dizziness, headache, nausea, profuse sweating, and pale clammy skin.

Heat stroke or the stage immediately preceding it includes bright red skin, or a bluish face or conjunctiva, tremors leading to convulsions, delirium, struggling, bright red chest area, hot skin, headache, and vertigo. Collapse, unconsciousness, coma, and death may follow.

Workers are encouraged to drink liquids from the time they wake up and frequently during the workday. Table 2 describes the recommended minimum breaks for work performed in protective clothing during hot weather.

The medical emergency response procedures for a victim who may have developed heat stress are described in Section 5.0.

2.4 HEAVY MACHINERY

Heavy machinery will be onsite during drilling, earthmoving, and equipment off-loading activities. Particular care will be maintained to avoid accidents. The hazard is increased if personal protective gear that reduces mobility is required. Many opportunities for accidents exist while working near heavy machinery. In general, workers will be aware of the danger of:

- Falling or swinging objects suspended from winches or cables.

- Drilling hardware breaking and flying free, especially while the rig is operating near its limit.
- Contacting overhead electrical lines with the drill rig mast.
- Exploding hoses.
- Entangling PPE with moving machinery (i.e., spinning augers, etc.).
- Slips, trips, and falls on drilling equipment (e.g., augers, etc.).

Each drilling rig and drilling method presents different specific hazards. Drilling rig and drilling method specific hazards will be discussed in the site safety meeting prior to initiating work and/or if a new method or drilling rig will be used at the site.

The onsite drilling supervisor is responsible for ensuring that the drill rig and the drilling site are ready for safe work conditions. He/she is responsible for ensuring that safe working procedures are followed.

Prior to drilling, the area utility locator will be contacted to determine the location of all suspected utility lines onsite. The use of a drill rig in the vicinity of electrical power lines, either overhead or buried, requires that special precautionary measures be taken by all involved in site work operations.

2.5 NOISE

Excessive noise is typically encountered while working with heavy machinery such as drilling rigs. The effects of working in the vicinity of noise include:

- Workers being startled, annoyed, or distracted.
- Physical damage to the ear, pain, and temporary and/or permanent hearing loss.

- Communication interference that may increase potential hazards due to the inability to warn of danger and the proper safety precautions to be taken.

Hearing protection will be required for drillers/personnel positioned near drill rigs or when in the immediate vicinity of these types of heavy equipment. Hearing protection will be available onsite (Section 4.4). The effect of occupational exposure to noise is monitored by Clayton or the subcontractor's medical surveillance program. Since voice communication may be affected during excessive noise, hand signals may be used in conjunction with voice communication. Hand signals are discussed in Section 4.1.

2.6 LOCK OUT / TAG OUT PROCEDURES

Site personnel will not be in situations requiring the use of lock out / tag out procedures during field activities; therefore, a description of the procedures is not required.

2.7 EARTH MOVING / EXCAVATION

During earthmoving activities, the contractor will comply with the requirements specified in 29 CFR 1926, Subparts "O" and "P."

The area utility locator will be contacted to determine the location of all suspected utility lines onsite. Earthwork/excavation in the vicinity of electrical power lines, either overhead or buried, requires special precautionary measures by all involved in site work operations.

The SHSO and earthmoving/excavation subcontractor's foreman are responsible for ensuring that the necessary equipment and work site are ready for safe working conditions. They are also responsible for ensuring that the safe working procedures summarized below are followed:

- All earthmoving/excavation equipment will be operated by qualified personnel following general safe operating procedures in terms of equipment tolerance, clearance, capacities, etc.

- Equipment shall be maintained properly, and periodically inspected to ensure safe operation.

- No unauthorized persons will be allowed within the limits of operations while any earthmoving/excavation equipment activities are going on.

- Any open excavation area left unattended during the day or overnight will be properly secured with caution tape from casual access.

3.0 SITE MONITORING AND ACTION LEVELS

Air monitoring will be performed, based on the chemicals of concern identified during previous site investigations, to ensure that appropriate engineering controls and PPE are adequate for the tasks being performed. During activities in which atmospheric monitoring is required, a photoionization detector (PID) with a 10.6 electron-volt (eV) lamp will be used. Most potentially hazardous VOCs are readily detectable with a PID instrument. The PID will be calibrated at the beginning of each day.

3.1 MONITORING FREQUENCY

The following chart summarizes the initial frequency of air monitoring with the PID for each of the principal field activities:

Field Activities	Initial Location and Frequency of Monitoring
Soil boring and soil sampling	Check borehole and breathing zone periodically during drilling/augering for escaping vapors. Monitor during the handling of the sample.
Monitoring well installation and development, electrode installation, vapor extraction well installation	Check borehole and breathing zone periodically during drilling for escaping vapors.
Groundwater sampling and measurement	Check well and breathing zone initially after opening well.
Earthmoving	Check breathing zone periodically during earthmoving for escaping vapors.

Air monitoring will be performed using a PID with an 10.6 eV probe that exceeds the ionization potentials of the chemicals of concern. Air monitoring may be decreased or increased in frequency depending on the conditions identified during field activities.

3.2 ACTION LEVELS

Unless otherwise stated, the following PID action levels are for the breathing zone during the investigation and remediation system installation phase of the project. Action levels are based on the lowest Time Weighted Average (TWA) for the chemicals of concern identified during previous site investigations (PCE, TCE, and DCE).

PID Reading (in ppm)	Personal Protection Level
Non-intrusive activity	Level D
Background < PID<25	Level D
25 < PID <250	Level C organic vapor cartridges
250 ≤ PID	Evacuate work area, allow to vent for 10 minutes, and then monitor again. If still above action level, evacuate area and contact SHSO.

NOTES:

The action levels were obtained from the *NIOSH Pocket Guide to Chemical Hazards*, U.S. Department of Health and Human Services, June 1997.

ppm = parts per million

Readings taken in the breathing zone will be documented in a field logbook. Respirators will be donned if Level C action levels are exceeded; respirators may be removed once Level C action levels are no longer exceeded. If the action levels for evacuation of the work area are exceeded, work will be suspended in the immediate vicinity of the borehole for 10 minutes in order to allow the excavation to vent. After the 10-minute venting period, air in the breathing zone will be monitored by a Clayton field supervisor wearing a respirator and approaching the hole from the upwind direction. If the PID indicates organic vapor concentrations are less than the action levels, work will continue; otherwise, the hole will be allowed to vent for 10 additional minutes, and the process will be repeated. If air-monitoring results in the breathing zone continue to exceed action limits, the work area will be evacuated.

4.0 ONSITE CONTROL

4.1 SITE COMMUNICATION

When voice communication is not possible, field investigators may utilize the following signals:

- Waving hand toward the body in a "come here" gesture – COME HERE.
- Pushing one or both hands away from the body in a "back up" gesture – BACK UP.
- Extending both arms, hands open, palms forward, and stopping them abruptly, directly in front of the torso at shoulder level – STOP RIGHT WHERE YOU ARE.
- Throwing the right clenched fist with extended right thumb abruptly over the right shoulder in a "let's get out of here" gesture – LET'S GET OUT OF HERE!
- Thumbs up – YES/EVERYTHING'S OKAY.
- Thumbs down – NO/THIS DOESN'T LOOK GOOD.
- Hands grasping throat – I'M CHOKING/OUT OF AIR.
- Hands of top of head – I NEED ASSISTANCE.

4.2 SAFETY ZONES AND ACCESS CONTROL

Control boundaries for site work will be established and will consist of the Exclusion Zone, the Contamination Reduction Zone, and the Support Zone. The following is a description of each control zone:

- The Exclusion Zone will be the area within 10 feet around an onsite monitoring well, borehole, or sampling point.
- The Contamination Reduction Zone (where decontamination activities occur) will be the area from the perimeter of the Exclusion Zone to a 15- to 20-foot radius.

- The Support Zone (support area where workers should not be exposed to hazardous conditions) will be the area beyond the Decontamination Zone.

Movement of equipment and personnel among these zones should be minimized to prevent cross-contamination from contaminated areas to clean zones.

Site personnel will be briefed by the SHSO as to the location of work areas and Exclusion Zones, decontamination area, telephone(s), eye wash, fire extinguisher(s), prevailing wind direction, utility lines (if not marked onsite), and first aid kit(s).

Potable water for health and safety procedures and decontamination procedures will be brought to the site as needed by site personnel and will be available in the Decontamination Zone and in the Clean Zone.

4.3 PERSONAL PROTECTIVE EQUIPMENT

All site investigatory activities will begin and will likely be completed using Level D PPE. The PPE will be upgraded to Level C if breathing zone atmosphere exceeds Level C action levels. In instances of continued windblown dust, Level C 1 HEPA filters shall be used. The specific PPE required for Level C and D is outlined in Table 4. Hearing protection will be available and is recommended for use during drilling operations.

Where air-purifying respirators are deemed necessary, organic vapor cartridges appropriate for use with the substances and concentrations anticipated will be worn (Level C). The make of the respirator and cartridge varies for each person depending on the results of individual fit-tests. Cartridges will be replaced at the start of each workday

and if or when breakthrough occurs. Changes to the levels of protection will not be made without the knowledge and approval of the SHSO.

A respiratory protection plan is in effect at Clayton. Clayton field personnel have been properly trained in care and maintenance of respirators. Clayton field personnel have been properly fitted and fit-tested according to OSHA regulations. Clayton personnel have been medically evaluated and cleared for respiratory protection use by a licensed physician.

4.4 ADDITIONAL EMERGENCY AND SAFETY EQUIPMENT

Whenever work is conducted, the following equipment will be available at the job site (e.g., Clayton field vehicle, or at a designated location in the Clean Zone):

- Ear plugs, disposable
- An ABC fire extinguisher (inspected annually) for each activity
- First aid kit that meets the requirements of 1926.50
- Biohazard kit as part of bloodborne pathogen prevention and minimization
- Traffic cones and/or caution tape

In addition, Material Safety Data Sheets (MSDS) or Chemical Hazards Response Information System (CHRIS) Sheets will be available at the site for substances that pose a reasonable health and safety risk to site personnel as listed in Section 2.1. MSDS and CHRIS Sheets are included as Attachment B.

4.5 DECONTAMINATION

All work will be performed in Level D personal protection, and no personal decontamination area will be set up. Should conditions change at the site causing an upgraded level of protection, an area will be specified, and all workers will be informed

of the necessary procedures (see Appendix F: Supplemental Personnel Decontamination Plan).

All reusable sampling equipment that comes into contact with site soils, sediments, and surface water will either be steam cleaned or washed with a detergent solution and rinsed with potable water.

While in Level D, all disposable protective clothing will be disposed of as general refuse. Decontamination of equipment will take place on designated areas onsite. If an upgrade to Level C occurs, all nondisposable protective equipment will be cleaned in a specified contaminant reduction zone prior to leaving the site. The protective equipment will be cleaned with a detergent wash and rinsed with potable water. Rinsate water will be managed onsite, pending offsite disposal.

5.0 CONTINGENCY AND EMERGENCY PROCEDURES

The nearest telephone will be a Clayton mobile phone. Subcontractors may also have a mobile phone.

The following contingency plans have been developed to deal with major incidents that might occur during field activities. Clayton employees and subcontractors will familiarize themselves with the location of the nearest permanent phone and the designated medical facility. The location of Advocate Good Samaritan Hospital is shown on Figure 3, together with the shortest route (3.78 miles / 11 minutes) from the site to the hospital. The route is as follows:

1. Go east on Ogden Avenue to Main Street.
2. Take Main Street (becomes Highland Ave.) north to Advocate Good Samaritan Hospital.

A copy of the "List of Emergency Telephone Numbers" (Section 5.5) will be carried along with Clayton's and the subcontractors' (if available) mobile phones. Contingency response plans will be reviewed with onsite personnel weekly to promote timely implementation of the contingency plan should one of the events described in the following section occur.

5.1 MEDICAL EMERGENCY RESPONSE PLAN

Should any person visiting or working at the site be injured or become ill, notify the SHSO and initiate the following emergency response plan:

Note: *The anticipated nature of chemical contamination on this project does not present an immediate threat to human health. Other than removal of outer garments and gross contamination, immediate emergency treatment of injuries will take precedence over rigorous personal decontamination.*

1. If able, the injured person will proceed to the nearest available source of first aid. If necessary, wash the injured area with soap and water.

2. If the injury involves foreign material in the eyes, immediately flush the eyes with emergency eye wash solution, and rinse with copious amounts of water at the nearest emergency eye wash station. Obtain or administer first aid as required. If further medical treatment is required, seek medical assistance as discussed below.

3. If the victim is unable to walk, but is conscious, and there is no evidence of spinal injury, escort or transport the injured person to the nearest first aid facility. If the victim cannot be moved without causing further injury, such as in the case of a severe compound fracture, take necessary emergency steps to control bleeding and immediately call for medical assistance as discussed below.

    - If the victim is unconscious or unable to move, **Do Not Move the Injured Person Unless Absolutely Necessary to Save His or Her Life**, until the nature of the injury has been determined.

    - If there is any evidence of spinal injury, do not move the victim. Administer CPR if the victim is not breathing, control severe bleeding, and immediately contact the Advocate Good Samaritan Hospital Emergency Room at 630.275.5900 and advise them of the situation. Otherwise, seek medical assistance as discussed below.

4. If the injury to the worker is related to the physical hazards previously identified in Section 2.0, appropriate first-aid procedures will be instituted as follows:

    - *Hypothermia* - If a worker suffers from hypothermia, medical attention will be sought immediately. The employee will be moved out of the cold, and warm clothing or blankets will be provided. Warming will take place slowly; no food or beverage will be administered.

    - *Frostbite* - Any worker suffering from frostbite will be moved to a warm area immediately. Frostbitten areas of the body will be placed in warm (100 to 105 degrees) water, NOT hot water. Areas of concern will be handled gently and will not be rubbed or massaged. If toes or fingers are affected, gauze will be placed between them after warming them. The injured parts will be loosely bandaged. If the part has been thawed and refrozen, it will be re-warmed at room temperature. If necessary, medical assistance will be sought.

    - *Heat Stroke* - If a worker suffers a heat stroke, medical attention will be sought immediately. The victim will be moved out of the heat and into a cooler area.

The victim will be cooled as quickly as possible by immersing him or her in a cool bath, or wrapping wet sheets around the body. While waiting for an ambulance to arrive, the victim will be watched for symptoms of shock. Nothing will be given orally.

- *Heat Exhaustion* - If any worker suffers from heat exhaustion, he or she will be moved out of the heat and into a cooler place. The victim will lie down with his or her feet up. Clothing will be removed or loosened; cold packs, wet towels, or sheets will be used to cool the skin. One-half glass of water will be administered every 15 minutes if the victim is fully conscious and can tolerate it. During all of these procedures, the victim will be observed for symptoms of shock. If the victim has not recovered within a half hour, or if the victim's condition worsens, medical attention will be sought.

5. If further medical treatment is required and

   (a) The injury is not severe, contact Advocate Good Samaritan Hospital and take the injured party to the hospital by private automobile.

   (b) The injury is severe, immediately call EMS (911). In the interim, call the Advocate Good Samaritan Hospital Emergency Room (630.275.5900) and advise them of the situation.

6. The SHSO will accompany the injured person to the hospital to ensure prompt and proper medical attention. After proper medical treatment has been obtained, the SHSO will notify the OHSO and prepare a written report.

5.2 FIRE AND EXPLOSIONS

In the event of a fire or explosion the SHSO will take the following steps:

1. If the situation is readily controllable, take immediate action to do so.

2. If the situation is uncontrollable, clear personnel working in the immediate area and notify the local Fire Department (911).

3. Notify the OHSO.

Clayton personnel will remain at the scene of the fire until the local fire department arrives. Once professional fire fighting personnel have arrived, Clayton personnel will remain at the disposal of the fire chief. The SHSO will function as liaison between response personnel in the incident.

If an emergency occurs which requires the evacuation of the site, a hand-held air horn will be activated/blow in several long, successive tones. Once the evacuation tone is sounded, all site personnel will expeditiously leave their work area and report to the primary meeting location. If the primary meeting location is determined to be unsafe, several short, successive tones will be sounded signaling egress to the secondary meeting location. All personnel will be informed of the primary and secondary meeting locations during the weekly tailgate meetings.

Primary Meeting Location:	West Site Entrance along Ogden Avenue
Secondary Meeting Location:	Main Entrance to the Bill Kay Car Dealership, adjacent to site.

5.3 CHEMICAL EXPOSURE FIRST AID

The following procedures will be followed in case of chemical exposure during field activities:

- *Eye contact*: Flush with clean water for 15 minutes or more. Try to flush under the lids. Get medical attention immediately.
- *Inhalation*: Get person to fresh air. Monitor for signs of exposure. Watch for signs of respiratory difficulty. Call EMS. Perform emergency rescue breathing, if appropriate, until relieved by an emergency unit.
- *Skin contact*: Flush area with clean water for at least 15 minutes. If burns are evident, get immediate medical attention. Do not use soap on affected area. BEWARE: Signs and symptoms may develop later due to dermal exposure.

- *Ingestion:* If contaminated materials are ingested, vomiting will not be induced. Medical attention will be sought immediately.

If anyone has been overexposed or has shown or is showing signs of exposure, he/she will be examined by a physician, according to OSHA's 1910.120 (f).

5.4 UNFORESEEN CIRCUMSTANCES

The Health and Safety procedures specified in this plan are based on available data that suggest minimal potential for worker exposure to significant levels of hazardous substances. If substantially higher levels of contamination are encountered in the soil or groundwater, and/or if situations arise that are obviously beyond the scope of the monitoring, respiratory protection, and decontamination procedures specified, work activities will be modified or, if necessary, halted pending discussion with the OHSO and implementation of appropriate protective measures.

5.5 LIST OF EMERGENCY TELEPHONE NUMBERS

Medical Services (EMS) Police/ Fire Department	911 911 -- Emergency
Advocate Good Samaritan Hospital 3815 Highland Avenue Downers Grove, Illinois	630.275.5900
Poison Control Center	800.942.5969
National Response Center	800.424.8802
IEPA Emergency Response	800.782.7860
Clayton Group Services, Inc. Mr. Ron St. John or Mr. Russell J. Chadwick	630.795.3200
Lockformer	630.964.8000

Mr. Rian Scheel

Mid-America Drilling Company 630.365.0600
Mr. Mike Crimaldi

6.0 CONFINED SPACE ENTRY

Site personnel will not be entering any confined spaces during field activities; therefore, confined space entry procedures are not required.

7.0 SPILL CONTAINMENT PROGRAM

Liquids generated during the implementation of site activities will include groundwater generated during development or purging of monitoring wells and liquids generated during decontamination procedures. The liquids will be collected and staged in a secure area onsite in a double-walled 4,000-gallon aboveground storage tank. The liquids will then be appropriately managed offsite.

8.0 REFERENCES

American Conference of Governmental Industrial Hygienists (ACGIH). *1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices,* 1991.

Clayton Environmental Consultants. *Corporate Safety and Health Plan*, 1997.

40 CFR 300 National Contingency Plan.

National Institute for Occupational Safety and Health (NIOSH) / OSHA / United States Coast Guard (USCG) / Environmental Protection Agency (EPA). *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, October 1985.

Occupational Safety and Health Administration (OSHA). Construction Industry Standards 29 CFR 1926.

OSHA General Industry Standards 29 CFR 1910.120. *Hazardous Waste Operations and Emergency Response.*

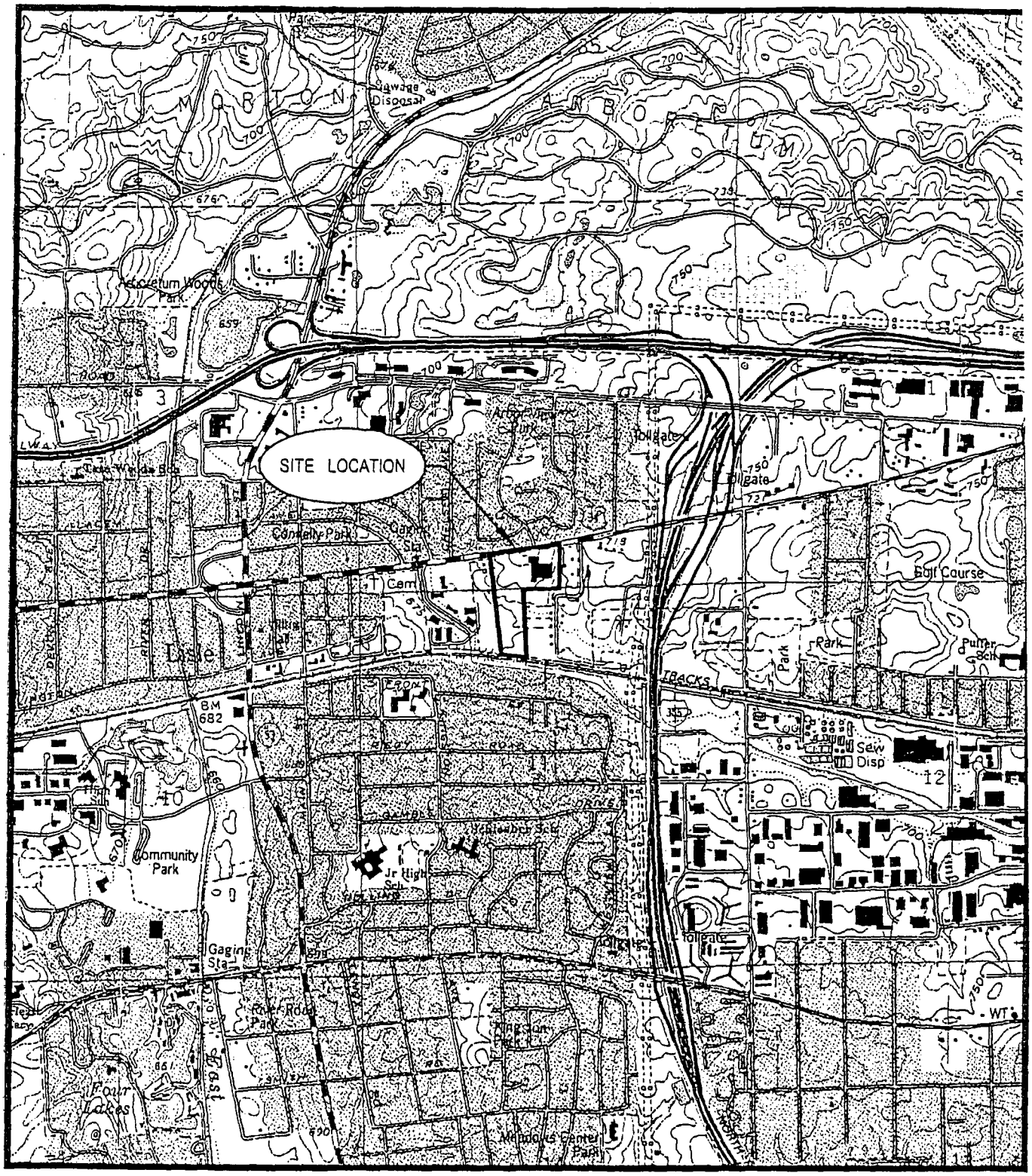
U.S. Department of Health and Human Services. *NIOSH Occupational Health Guidelines for Chemical Hazards*, January 1991.

U.S. Department of Health and Human Services. *NIOSH Pocket Guide to Chemical Hazards,* June 1997.

ISOPIA Guidance Document. *Standard Operating Safety Guides*, June 1992.

ISOPIA software. *Superfund Health and Safety Planner*, 1993.

FIGURES



Scale 1:24000

0 1/2 1 MILE

1000 0 1000 2000 3000 FEET

QUADRANGLE LOCATION

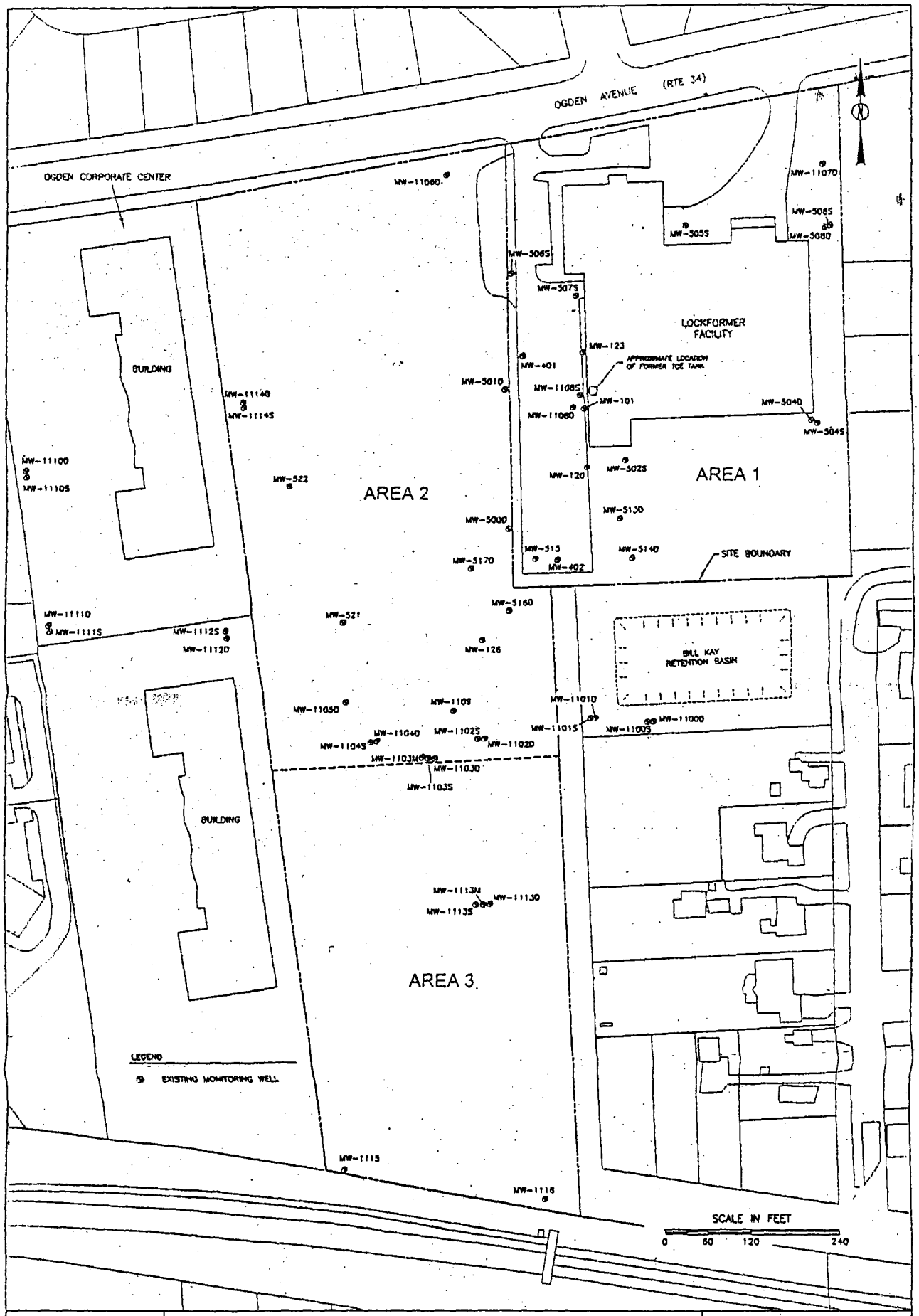
FIGURE 1

SITE LOCATION MAP

THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

CAD NO.: 65263010F

(SOURCE OF MAP IS USGS 7.5 MINUTE QUADRANGLE MAP, WHEATON, ILLINOIS)



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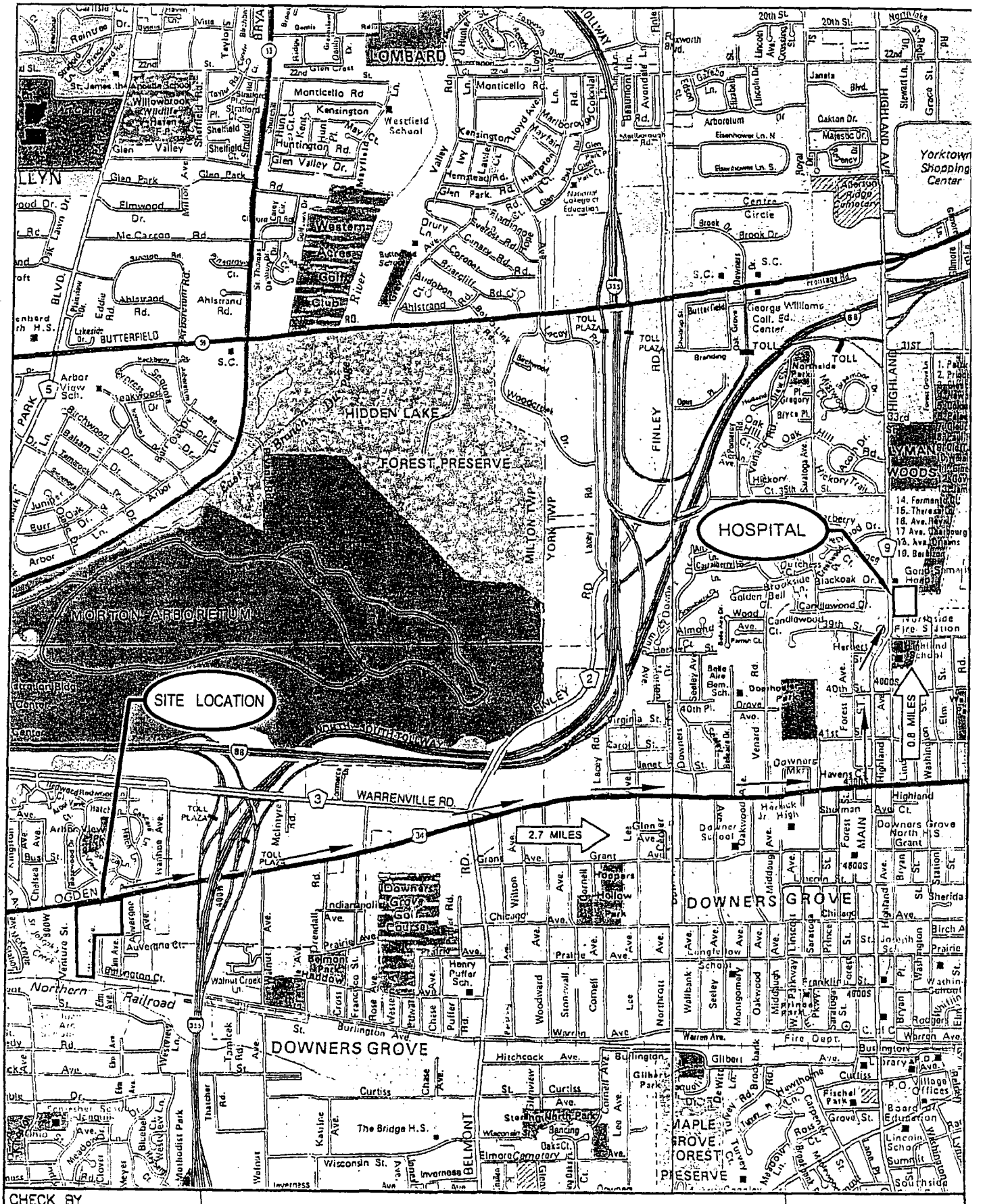
DATE	4-5-02
SCALE	AS SHOWN
CAD NO.	65263010E
PRJ NO.	65263.01

SITE MAP ILLUSTRATING AREAS 1, 2 AND 3

THE LOCKFORMER COMPANY
711 W. OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES
3140 FINLEY ROAD, DOWNERS GROVE, IL 60515

FIGURE 2



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DRAWN BY	BCP
DATE	4-15-02
SCALE	AS SHOWN
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PRJ NO.	65263.01

ROUTE TO HOSPITAL

THE LOCKFORMER COMPANY
711 OGDEN AVENUE
LISLE, ILLINOIS

Clayton GROUP SERVICES

FIGURE
3

TABLES

TABLE 1

Recommended Work Breaks During Cold Weather For A Four-Hour Work Period

AIR TEMPERATURE SUNNY SKY (F)	NO WIND		5 MPH WIND		10 MPH WIND		15 MPH WIND		20 MPH WIND	
	Work Period	Breaks	Work Period	Breaks	Work Period	Breaks	Work Period	Breaks	Work Period	Breaks
-15 to -19	Normal	Normal	Normal	Normal	75 min.	2	55 min.	3	40 min.	4
-20 to -24	Normal	Normal	75 min.	2	55 min.	3	40 min.	4	30 min.	5
-25 to -29	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Stop Work	Stop Work
-30 to -34	55 min.	3	40 min.	4	30 min.	5	Stop Work	Stop Work	Stop Work	Stop Work
-35 to -39	40 min.	4	30 min.	5	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work
-40 to -44	30 min.	5	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work
-45 and	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work

Source: *1991-1992 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH, 1991.*

TABLE 2

Recommended Work Breaks During Hot Weather

TEMPERATURE	WORK	REST	COMMENTS
70 to 75 F	3.0 hours	5 minutes	Review heat stress in a safety meeting. Schedule a beverage break every 2 hours at a minimum.
75 to 80 F	3.0 hours	15 minutes	Seated rest. Drink at least 8 ounces at each break. Monitor daily body weight changes. Have at least 10 instant ice packs or bags of ice available.
80 to 85 F	2.0 hours	10 minutes	As above, but rest area to be shaded. Take pulse before work, at beginning of lunch break, and at end of day.
85 to 90 F	1.5 hours	10 minutes	As above, and try to provide a shaded work area. More frequent breaks may be required.
90 and	1.5 hours	10 minutes	As above. Try to reschedule work to avoid mid-day heat.

TABLE 3

Properties of Potentially Hazardous Substances of Concern*

Chemical	IDLH (ppm)	REL (ppm)	PEL (ppm)	Skin Irritant	Eye Irritant	Respiratory Irritant	Flash Point (°F)	LEL (%)	UEL (%)	Vapor Pressure (mm Hg)	Ionization Potential (eV)
Tetrachloroethene	500	lowest feasible	25	Yes	yes	yes	none	none	none	14	9.32
Trichloroethene	1,000	25	50	Yes	yes	yes	90	8	10.5	58	9.45
1,2-dichloroethene cis-1,2-dichloroethene trans-1,2-dichloroethene	4,000	200	200	Yes	yes	yes	36	5.6	12.8	180-264	9.65

* NIOSH Occupational Health Guidelines for Chemical Hazards, U.S. Department of Health and Human Services, January 1991.

NOTES:
1. IDLH = Quantity that is rapidly fatal or likely to promote life-threatening disease.
2. REL = NIOSH's Recommended Exposure Limit
3. PEL = OSHA's Permissible Exposure Limit

TABLE 4
Personal Protective Equipment (PPE) Requirements

Level of Protection	Equipment Required		Notes
D	Head Protection:	Hard Hat	Must Meet ANSI Z89.1
	Eye & Face Protection:	Safety Glasses	Must Meet ANSI Z87
	Ear & Hearing Protection:	Earplugs or Earmuffs	For work areas involving machinery when noise level prevents conversion in a normal voice at a distance of 3 feet.
	Body Protection:	Standard Work Clothes	Long pants, etc.
	Arm & Hand Protection:	Nitrile Gloves	Surgical type
	Foot Protection:	Steel-toe Boots	Must Meet ANSI Z41
C	Head Protection:	Hard Hat	Must Meet ANSI Z89.1
	Eye & Face Protection:	Air-Purifying, Full-Face Piece Respirator	Comply with 29 CFR 1910.134. Inspect respirator prior to and after each use.
		MSHA/NIOSH Approved Cartridge	Organic Vapor with HEPA filter. Change cartridge at least once per day.
	Ear & Hearing Protection:	Earplugs or Earmuffs	For work areas involving machinery when noise level prevents conversion in a normal voice at a distance of 3 feet.
	Body Protection:	Tyvek Suit	
	Arm & Hand Protection:	Inner Glove: Nitrile	Surgical type
		Outer Glove: Nitrile	
	Foot Protection:	Steel-toe Boots	Must Meet ANSI Z41
		Disposable, Rubber Overboots	

ATTACHMENT A

TAILGATE MEETING MINUTES FORM

TAILGATE MEETING MINUTES

Project No.: _____ Client: _____

Location: _____ Month: _____

# of Employees: _____

Safety Topic #: _____ Title: _____

Other items discussed/listed:

_____

_____

Employee Safety Suggestions:

_____

_____

_____ / _____ _____

Supervisor's signature / Print Name Date

EMPLOYEE NAMES:

Print Name	Signature

COMPLETED FORM TO BE RETURNED TO H&S COORDINATOR

TAILGATE MEETING MINUTES

Project No.: _____ Client: _____

Location: _____ Month: _____

# of Employees: _____

Safety Topic #: _____ Title: _____

Other items discussed/listed:

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Print Name	Signature

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Safety Topic #: _____ Title: _____

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Employee Safety Suggestions:

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_____ / _____ _____

Supervisor's signature / Print Name Date

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_____

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Employee Safety Suggestions:

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_____

_____ / _____ _____

Supervisor's signature / Print Name Date

EMPLOYEE NAMES:

Print Name	Signature

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Location: _____ Month: _____

# of Employees: _____

Safety Topic #: _____ Title: _____

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Employee Safety Suggestions:

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Supervisor's signature / Print Name Date

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Print Name	Signature

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_____ _____

Supervisor's signature / Print Name Date

EMPLOYEE NAMES:

Print Name	Signature

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# of Employees: _____

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Supervisor's signature / Print Name Date

EMPLOYEE NAMES:

Print Name	Signature

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# of Employees: _____

Safety Topic #: _____ Title: _____

Other items discussed/listed:

_____

_____

Employee Safety Suggestions:

_____

_____

_____ / _____ _____

Supervisor's signature / Print Name Date

EMPLOYEE NAMES:

Print Name	Signature

COMPLETED FORM TO BE RETURNED TO H&S COORDINATOR

ATTACHMENT B

MSDS AND CHRIS SHEETS

TRICHLOROETHYLENE

TCL

CAUTIONARY RESPONSE INFORMATION

Common Synonyms			
Chlorylen Gemalgene Trethylene *Trichloran* Triclene; algylen Trilene	Watery liquid	Colorless	Sweet odor
	Sinks in water. Irritating vapor is produced.		

Keep people away.
Avoid contact with liquid and vapor.
Call fire-department.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, carbon dioxide, or foam.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Pump

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 36; Halogenated hydrocarbon
2.2 Formula: $CHCl=CCl_2$
2.3 IMO/UN Designation: 6.1/1710
2.4 DOT ID No.: 1710
2.5 CAS Registry No.: 79-01-6
2.6 NAERG Guide No.: 160
2.7 Standard Industrial Trade Classification: 31132

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or vinyl gloves; chemical safety goggles; face-shield; neoprene safety shoes; neoprene suit or apron for splash protection.
3.2 Symptoms Following Exposure: INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: slightly irritating sensation and lachrymation.
3.3 Treatment of Exposure: Do NOT administer adrenalin or epinephrine; get medical attention for all cases of overexposure. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting; repeat three times; then give 1 tablespoon epsom salts in water. EYES: flush thoroughly with water. SKIN: wash thoroughly with soap and warm water.
3.4 TLV-TWA: 50 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: 100 ppm
3.7 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Currently not available
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 50 ppm
3.13 IDLH Value: 1,000 ppm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: 300 ppm, 5 minute peak in any 2 hours.
3.16 OSHA PEL-Ceiling: 200 ppm
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 90°F C.C. practically nonflammable
4.2 Flammable Limits in Air: 8.0%-10.5%
4.3 Fire Extinguishing Agents: Water fog
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Toxic and irritating gases are produced in fire situations.
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: 770°F
4.8 Electrical Hazards: Not pertinent
4.9 Burning Rate: Not pertinent
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 9.5 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 4.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): No diluent: 9.0% at 100°C

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: 660 mg/l/48 hr/daphnia/freshwater
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): Currently not available
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile:
Bioaccumulation:
Damage to living resources:
Human Oral hazard:
Human Contact hazard:
Reduction of amenities:

7. SHIPPING INFORMATION

7.1 Grades of Purity: Technical; dry cleaning; degreasing; extraction
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Pressure-vacuum
7.5 IMO Pollution Category: C
7.6 Ship Type: 3
7.7 Barge Hull Type: 3

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Keep Away From Food
8.2 49 CFR Class: 6.1
8.3 49 CFR Package Group: III
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Instability (Yellow)	0

8.6 EPA Reportable Quantity: 100 pounds
8.7 EPA Pollutee Category: B
8.8 RCRA Waste Number: U228
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 131.39
9.3 Boiling Point at 1 atm: 189°F = 87°C = 360°K
9.4 Freezing Point: -123.5°F = -86.4°C = 186.9°K
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 1.46 at 20°C (liquid)
9.8 Liquid Surface Tension: 29.3 dynes/cm = 0.0293 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 34.5 dynes/cm = 0.0345 N/m at 24°C
9.10 Vapor (Gas) Specific Gravity: 4.5
9.11 Ratio of Specific Heats of Vapor (Gas): 1.118
9.12 Latent Heat of Vaporization: 103 Btu/lb = 57.2 cal/g = 2.4 X 10^5 J/kg
9.13 Heat of Combustion: Not pertinent
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 2.5 psia

NOTES

TRICHLOROETHYLENE

TCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	94.669	0	0.220		N	15	0.806
5	94.410	10	0.221		O	20	0.775
10	94.150	20	0.223		T	25	0.750
15	93.889	30	0.225			30	0.727
20	93.629	40	0.226		F	35	0.705
25	93.370	50	0.228		E	40	0.684
30	93.110	60	0.230		R	45	0.664
35	92.849	70	0.231		T	50	0.645
40	92.589	80	0.233		I	55	0.627
45	92.330	90	0.235		N	60	0.610
50	92.070	100	0.236		E	65	0.593
55	91.809	110	0.238		N	70	0.577
60	91.549	120	0.240		T	75	0.562
65	91.290	130	0.241			80	0.548
70	91.030	140	0.243			85	0.534
75	90.770	150	0.245			90	0.521
80	90.509	160	0.246			95	0.508
85	90.250	170	0.248			100	0.496
90	89.990					105	0.485
95	89.730					110	0.474
100	89.469					115	0.463
105	89.209					120	0.453
110	88.950						
115	88.690						
120	88.429						
125	88.169						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.110	40	0.508	40	0.01245	0	0.136
		50	0.673	50	0.01628	25	0.139
		60	0.894	60	0.02105	50	0.143
		70	1.166	70	0.02695	75	0.146
		80	1.507	80	0.03416	100	0.149
		90	1.929	90	0.04296	125	0.152
		100	2.444	100	0.05354	150	0.155
		110	3.061	110	0.06619	175	0.157
		120	3.805	120	0.08120	200	0.160
		130	4.703	130	0.09891	225	0.162
		140	5.782	140	0.11960	250	0.165
		150	7.103	150	0.14366	275	0.167
		160	8.695	160	0.17156	300	0.169
		170	10.496	170	0.20390	325	0.172
		180	12.586	180	0.24088	350	0.174
		190	15.018	190	0.28286	375	0.176
		200	17.816	200	0.33040	400	0.177
		210	21.028	210	0.38428	425	0.179
						450	0.181
						475	0.182
						500	0.184
						525	0.185
						550	0.186
						575	0.187
						600	0.188

TETRACHLOROETHYLENE

TTE

CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Watery liquid	Colorless	Sweet odor
Perchloroethylene Perclene Perk Tetracap	Sinks in water. Irritating vapor is produced.		

Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

Not flammable.
Poisonous gases are produced when heated.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Pump
Clean shore line

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.
2.2 Formula: C_2Cl_4
2.3 IMO/UN Designation: 6.1/1897
2.4 DOT ID No.: 1897
2.5 CAS Registry No.: 127-18-4
2.6 NAERG Guide No.: 160
2.7 Standard Industrial Trade Classification: 51133

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: For high vapor concentrations use approved canister or air-supplied mask; chemical goggles or face shield; plastic gloves.
3.2 Symptoms Following Exposure: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.
3.3 Treatment of Exposure: INHALATION: If illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. INGESTION: Induce vomiting only on physician's recommendation. EYES AND SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.
3.4 TLV-TWA: 25 ppm
3.5 TLV-STEL: 100 ppm
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: None
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or throat if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 1 ppm
3.13 IDLH Value: 150 ppm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: 300 ppm, 5 minute peak in any 3 hours
3.16 OSHA PEL-Ceiling: 200 ppm
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: Not flammable
4.2 Flammable Limits in Air: Not flammable
4.3 Fire Extinguishing Agents: Not pertinent
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Toxic, irritating gases may be generated in fires.
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: Not flammable
4.8 Electrical Hazards: Not pertinent
4.9 Burning Rate: Not flammable
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): None
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile: Not listed

7. SHIPPING INFORMATION

7.1 Grades of Purity: Dry cleaning and industrial grades: 95+%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Pressure-vacuum
7.5 IMO Pollution Category: B
7.6 Ship Type: 3
7.7 Barge Hull Type: 3

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Keep Away From Food
8.2 49 CFR Class: 6.1
8.3 49 CFR Package Group: III
8.4 Marine Pollutant: Yes
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Instability (Yellow)	0

8.6 EPA Reportable Quantity: 100 pounds
8.7 EPA Pollution Category: B
8.8 RCRA Waste Number: U210/D038
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 165.83
9.3 Boiling Point at 1 atm: 250°F = 121°C = 394°K
9.4 Freezing Point: -8.3°F = -22.4°C = 250.8°K
9.5 Critical Temperature: 656.8°F = 347°C = 620.2°K
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 1.63 at 20°C (liquid)
9.8 Liquid Surface Tension: 31.3 dynes/cm = 0.0313 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 44.4 dynes/cm = 0.0444 N/m at 25°C
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): 1.116
9.12 Latent Heat of Vaporization: 90.2 Btu/lb = 50.1 cal/g = 2.10 X 10^5 J/kg
9.13 Heat of Combustion: Not pertinent
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: Currently not available

NOTES

TETRACHLOROETHYLENE

TTE

3.20 SATURATED LIQUID DENSITY		3.21 LIQUID HEAT CAPACITY		3.22 LIQUID THERMAL CONDUCTIVITY		3.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	103.400	0	0.196		N	35	0.958
40	103.099	10	0.198		O	60	0.929
45	102.900	20	0.201		T	55	0.900
50	102.199	30	0.202			70	0.873
55	102.299	40	0.203		P	75	0.846
60	102.000	50	0.204		E	80	0.823
65	101.700	60	0.205		N	85	0.800
70	101.400	70	0.206		T	90	0.777
75	101.099	80	0.207		I	95	0.756
80	100.799	90	0.208		N	100	0.736
85	100.500	100	0.210		E	105	0.716
90	100.200	110	0.211		N	110	0.696
95	99.910	120	0.212		T	115	0.680
100	99.610	130	0.213			120	0.663
105	99.329	140	0.214			125	0.647
110	99.026	150	0.215			130	0.631
115	98.730	160	0.216			135	0.616
120	98.425	170	0.217			140	0.601
125	98.139	180	0.218			145	0.588
130	97.839	190	0.219			150	0.574
135	97.548	200	0.221			155	0.561
140	97.250	210	0.222			160	0.548
145	96.959					165	0.537
150	96.669					170	0.526
155	96.379					175	0.515
160	96.088						

3.24 SOLUBILITY IN WATER		3.25 SATURATED VAPOR PRESSURE		3.26 SATURATED VAPOR DENSITY		3.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.015	60	0.226	60	0.00702	0	0.106
		70	0.310	70	0.00923	25	0.110
		80	0.423	80	0.01216	50	0.113
		90	0.561	90	0.01575	75	0.116
		100	0.732	100	0.02022	100	0.118
		110	0.948	110	0.02571	125	0.120
		120	1.217	120	0.03242	150	0.122
		130	1.544	130	0.04055	175	0.125
		140	1.953	140	0.05032	200	0.127
		150	2.444	150	0.06198	225	0.129
		160	3.042	160	0.07583	250	0.131
		170	3.756	170	0.09215	275	0.133
		180	4.607	180	0.11118	300	0.134
		190	5.616	190	0.13340	325	0.136
		200	6.805	200	0.15944	350	0.138
		210	8.199	210	0.18910	375	0.139
		220	9.824	220	0.22336	400	0.141
		230	11.710	230	0.26238	425	0.142
		240	13.880	240	0.30660	450	0.143
		250	16.360	250	0.35644	475	0.144
		260	19.200	260	0.41239	500	0.146
		270	22.520	270	0.47500	525	0.147
		280	26.330	280	0.54736	550	0.148
						575	0.144
						600	0.149

1,2-DICHLOROETHYLENE

DEL

CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Sweet pleasant odor
Acetylene dichloride trans-1,2-Dichloroethylene cis-1,2-Dichloroethylene sym-Dichloroethylene Dioform	Sinks in water. Flammable, irritating vapor is produced.		

Evacuate.
Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources. Call fire department.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

FLAMMABLE.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

Call for medical aid.

VAPOR
If inhaled will cause dizziness, nausea, vomiting, or difficult breathing.
Move victim to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Harmful if swallowed.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Collection Systems: Pump
Collection Systems: Dredge
Do not burn

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.
2.2 Formula: ClCH = CHCl
2.3 IMO/UN Designation: 3.2/1150
2.4 DOT ID No.: 1150
2.5 CAS Registry No.: 540-59-0
2.6 NAERG Guide No.: 132P
2.7 Standard Industrial Trade Classification: 51138

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Rubber gloves; safety goggles; air supply mask or self- contained breathing apparatus.
3.2 Symptoms Following Exposure: Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep narcosis.
3.3 Treatment of Exposure: INHALATION: remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth-to-mouth; give oxygen when breathing is resumed; call a physician. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give gastric lavage and cathartics.
3.4 TLV-TWA: 200 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 2; oral LD_{50} = 770 mg/kg (rat)
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Produces liver and kidney injury in experimental animals.
3.10 Vapor (Gas) Irritant Characteristics: Currently not available
3.11 Liquid or Solid Characteristics: Currently not available
3.12 Odor Threshold: Currently not available
3.13 IDLH Value: 1,000 ppm
3.14 OSHA PEL-TWA: 200 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 37°F C.C.
4.2 Flammable Limits in Air: 9.7%-12.8%
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
4.5 Special Hazards of Combustion Products: Phosgene and hydrogen chloride fumes may form in fires.
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
4.7 Auto Ignition Temperature: 860°F
4.8 Electrical Hazards: Currently not available
4.9 Burning Rate: 2.8 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichiometric Air to Fuel Ratio: 5.5 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 4.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Will not occur under ordinary conditions of shipment. The reaction is not vigorous.
5.6 Inhibitor of Polymerization: None used

6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): Currently not available
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 1
Human Oral hazard: 1
Human Contact hazard: 1
Reduction of amenities: X

7. SHIPPING INFORMATION

7.1 Grades of Purity: Commercial
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Pressure-vacuum
7.5 IMO Pollution Category: Currently not available
7.6 Ship Type: Currently not available
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: II
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Instability (Yellow)	2

8.6 EPA Reportable Quantity: 1000 pounds
8.7 EPA Pollution Category: C
8.8 RCRA Waste Number: U079
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 97.0
9.3 Boiling Point at 1 atm: cis: 140°F = 60°C = 333°K trans: 118°F = 48°C = 321°K
9.4 Freezing Point: cis: -114°F = -81°C = 192°K trans: -58°F = -50°C = 223°K
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 1.27 at 25°C (liquid)
9.8 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C
9.9 Liquid Water Interfacial Tension: (est.) 38 dynes/cm = 0.038 N/m at 20°C
9.10 Vapor (Gas) Specific Gravity: 3.34
9.11 Ratio of Specific Heats of Vapor (Gas): 1.1486
9.12 Latent Heat of Vaporization: 130 Btu/lb = 72 cal/g = 3.0 X 10^5 J/kg
9.13 Heat of Combustion: -4,847.2 Btu/lb = -2,692.9 cal/g = -112.67 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: Currently not available

NOTES

1,2-DICHLOROETHYLENE

DEL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
35	81.020	35	0.193
40	80.820	40	0.196
45	80.610	45	0.198
50	80.400	50	0.200
55	80.190	55	0.202
60	79.984	60	0.204
65	79.774	65	0.207
70	79.570	70	0.209
75	79.360	75	0.211
80	79.150	80	0.213
85	78.940	85	0.216
90	78.740	90	0.218
95	78.530	95	0.220
100	78.320	100	0.222
105	78.110	105	0.224
110	77.900	110	0.227
115	77.690	115	0.229
120	77.490	120	0.231
125	77.280	125	0.233
130	77.070	130	0.236
135	76.860	135	0.238
140	76.650	140	0.240

9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
65	0.907	40	0.473
70	0.894	50	0.454
75	0.882	60	0.432
80	0.869	70	0.411
85	0.857	80	0.393
90	0.844	90	0.376
95	0.832	100	0.360
100	0.819	110	0.345
105	0.807	120	0.331
110	0.794	130	0.319
115	0.782	140	0.307
120	0.769	150	0.296
125	0.757	160	0.286
130	0.744	170	0.276
		180	0.267
		190	0.259
		200	0.251
		210	0.244

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch
68	0.630	55	3.049
		60	3.396
		65	3.824
		70	4.257
		75	4.817
		80	5.348
		85	6.016
		90	6.762
		95	7.453
		100	8.272
		105	9.164
		110	10.130
		115	11.190
		120	12.330
		125	13.560
		130	14.900
		135	16.340
		140	17.890

9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
55	0.05284	0	0.150
60	0.05904	20	0.153
65	0.06587	40	0.156
70	0.07334	60	0.159
75	0.08141	80	0.162
80	0.09023	100	0.165
85	0.09948	120	0.167
90	0.11026	140	0.170
95	0.12148	160	0.173
100	0.13364	180	0.176
105	0.14640	200	0.179
110	0.16070	220	0.182
115	0.17590	240	0.185
120	0.19220	260	0.188
125	0.20940	280	0.191
130	0.22830	300	0.194
135	0.24820	320	0.197
140	0.26940	340	0.200
		360	0.203
		380	0.206
		400	0.208
		420	0.211
		440	0.214

ATTACHMENT C

SITE SIGN IN LOG

LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME				PURPOSE OF VISIT
			IN	OUT	IN	OUT	

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
SUP = Supplier COU = Courier VIS = Visitor

LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME IN	TIME OUT	TIME IN	TIME OUT	PURPOSE OF VISIT

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
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LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME				PURPOSE OF VISIT
			IN	OUT	IN	OUT	

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
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LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME				PURPOSE OF VISIT
			IN	OUT	IN	OUT	

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
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LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME IN	TIME OUT	TIME IN	TIME OUT	PURPOSE OF VISIT

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
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LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME				PURPOSE OF VISIT
			IN	OUT	IN	OUT	

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
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LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME				PURPOSE OF VISIT
			IN	OUT	IN	OUT	

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
SUP = Supplier COU = Courier VIS = Visitor

LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME IN	TIME OUT	TIME IN	TIME OUT	PURPOSE OF VISIT

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
SUP = Supplier COU = Courier VIS = Visitor

LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME IN	TIME OUT	TIME IN	TIME OUT	PURPOSE OF VISIT

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
SUP = Supplier COU = Courier VIS = Visitor

LOCKFORMER COMPANY
DAILY SIGN IN LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Designation	TIME IN	TIME OUT	TIME IN	TIME OUT	PURPOSE OF VISIT

Designations: CON = Contractor OVR = Consultant/Oversight REG = Regulatory Agency SUB = Subcontractor
SUP = Supplier COU = Courier VIS = Visitor

ATTACHMENT D

EXCLUSION ZONE ENTRY/EXIT LOG

LOCKFORMER COMPANY
EXCLUSION ZONE ENTRY / EXIT LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Level of Protection	TIME				TASK / ASSIGNMENT
			IN	OUT	IN	OUT	

LOCKFORMER COMPANY
EXCLUSION ZONE ENTRY / EXIT LOG

DATE: _____ Page #___ of ___

PRINT NAME	Company	Level of Protection	TIME				TASK / ASSIGNMENT
			IN	OUT	IN	OUT	

ATTACHMENT E

BLOODBORNE PATHOGEN TRAINING

Bloodborne Pathogen (BBP) Training Record

CLAYTON GROUP SERVICES, INC.

Prepared for Site Activities at:

Lockformer Company, 711 W. Odgen Avenue, Lisle, Illinois

Clayton Project No. 15-65263

I, the undersigned, certify that I:

- Received a copy of the OSHA Bloodborne Pathogen Standard (29 CFR 1910.1030)
- Understand the topics listed above.
- Understand my responsibilities in regards to preventation and minimization of exposure to BBPs

Signature	Company	Title

Additional comments, concerns, or other information may be listed on the back side of this form.

ATTACHMENT F

SUPPLEMENTAL PERSONNEL DECONTAMINATION PLAN

SUPPLEMENTAL PERSONNEL DECONTAMINATION PLAN

In the event the level of personal protection is upgraded to Level C, the following personnel decontamination procedure will be followed:

1. Upon leaving the Exclusion Zone / Hot Zone (EZ), personnel will enter the Contamination Reduction Zone / Warm Zone (CRZ). Non-disposable equipment will be placed just inside the CRZ at the Equipment Drop Point.

2. Boot covers and outer gloves will be washed with an alconox & water solution and rinsed with potable water.

3. Tape will be removed.

4. Boot covers and outer gloves will be removed and containerized.

5. Outer garment and safety boots will be washed with an alconox & water solution and rinsed with potable water.

6. Personnel can change cartridges, outer gloves, and boot covers and re-enter the EZ or proceed to the next step in the decontamination process.

7. Outer garment will be removed and containerized.

8. Inner gloves will be washed with an alconox & water solution and rinsed with potable water.

9. Respirator / face piece will be removed.

10. Inner glove will be removed and containerized.

11. Personnel will exit the CRZ and enter the Support Zone / Cold Zone (SZ).

See Figure F-1

FIGURE F - 1
DECONTAMINATION LAYOUT
LEVEL C PROTECTION